KOA CORPORATION
PLANNING & ENGINEERING

MEMORANDUM

To: Doug Bilse, City of Carlsbad
From: Arnold Torma, P.E., KOA Corporation
KOA No.: JB14055
Date: June 16, 2011

Re: **La Costa Avenue LOS Analysis**

Introduction

The City of Carlsbad requested KOA Corporation to conduct intersection and segment analysis for the LA Costa Avenue Improvement Project. The results in this memorandum are presented for the following alternatives:

1. Existing Condition
2. Painted Median
3. Road Diet
4. Hybrid

ICU analysis for intersections was conducted at the following three signalized intersections:

1. La Costa Avenue and Viejo Castilla Way
2. La Costa Avenue and Romeria Street
3. La Costa Avenue and Cadencia Street

Figure 1 below shows the geometry comparison of all the alternatives for the three intersections.

Roadway segmental LOS analysis was conducted between the Shopping Center Driveway and Nueva Castilla Way for the above mentioned alternatives and the results presented in this memorandum. The the City's annual monitoring method was used for the roadway segments. The worksheets are provided in the Appendix.

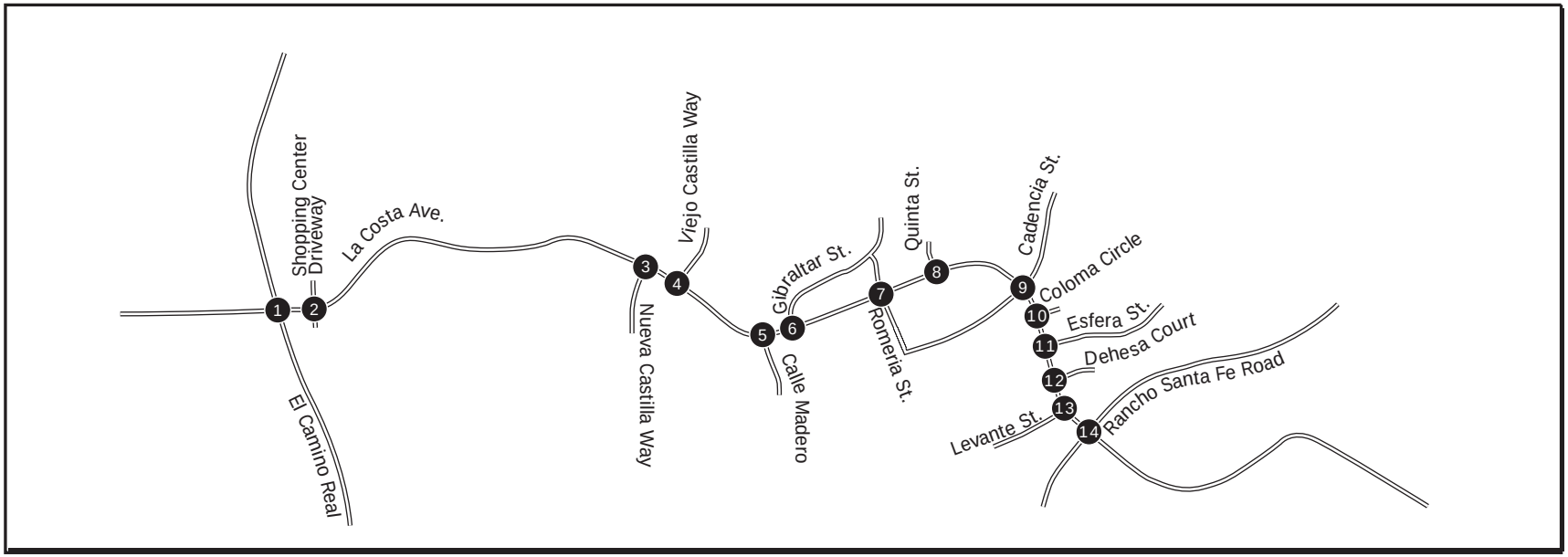
Finally, we offer a generalized estimate of the adequacy of potential roundabouts and their capacity using the ITE publication "Roundabouts: An Informational Guide".

Findings

Each of the three internal signalized intersections along the length of the project presently operate during peak hours at completely acceptable levels of service (A and B) and delay and continue to do so into the future conditions projected in this analysis and under all alternatives.

The segmental analysis produced results that were acceptable (LOS=D or better) in the existing and future scenarios in the peak conditions for all of the alternative configurations.

Regarding potential roundabouts, the ITE publication cited above offers a generalized expectation of what the overall capacity of the facility might be based on ADT values (refer to their table in Exhibit 3-8 shown in the appendix). The typical maximum ADT capacity of a roundabout is 25,000 ADT in a balanced situation where side street traffic is equivalent to the major street volumes. As the imbalance increases (as is the situation on La Costa Ave) the overall capacity diminishes to around 18,000 to 19,000 where the side streets have only 10% of the entering traffic. The existing traffic levels maximize around 18,000 presently and rise to around 22,000 in the future. Depending on where along La Costa Ave a roundabout is considered the volumes may decrease from these values somewhat. This suggests that in the imbalanced situation that is likely to exist on La Costa Ave we will be approaching the capacity of a typical roundabout assuming there is no diversion of traffic. More specific analysis can be provided once locations are selected for consideration and a conceptual layout is developed.



Alternatives	4 Viejo Castilla Way	7 Romeria Street	9 Cadencia Street
Existing			
Painted Median			
Road Diet			
Hybrid			

N

Not To Scale

Existing Intersection Condition at La Costa Avenue and Viejo Castilla Way

Alternatives	ICU Methodology			
	AM		PM	
	ICU	LOS	ICU	LOS
Existing	0.383	A	0.335	A
Painted Median	0.391	A	0.335	A
Road Diet	0.569	A	0.531	A
Hybrid	0.565	A	0.432	A

Horizon Year Intersection Condition at La Costa Avenue and Viejo Castilla Way

Alternatives	ICU Methodology			
	AM		PM	
	ICU	LOS	ICU	LOS
Horizon	0.442	A	0.386	A
Painted Median	0.450	A	0.386	A
Road Diet	0.666	B	0.626	B
Hybrid	0.666	B	0.504	A

Existing Intersection Condition at La Costa Avenue and Romeria Street

Alternatives	ICU Methodology			
	AM		PM	
	ICU	LOS	ICU	LOS
Existing	0.358	A	0.438	A
Painted Median	0.364	A	0.443	A
Road Diet	0.455	A	0.438	A
Hybrid	0.358	A	0.438	A

Horizon Year Intersection Condition at La Costa Avenue and Romeria Street

Alternatives	ICU Methodology			
	AM		PM	
	ICU	LOS	ICU	LOS
Horizon	0.415	A	0.512	A
Painted Median	0.421	A	0.517	A
Road Diet	0.534	A	0.512	A
Hybrid	0.415	A	0.512	A

Existing Intersection Condition at La Costa Avenue and Cadencia Street

Alternatives	ICU Methodology			
	AM		PM	
	ICU	LOS	ICU	LOS
Existing	0.423	A	0.423	A
Painted Median	0.429	A	0.428	A
Road Diet	0.423	A	0.423	A
Hybrid	0.423	A	0.423	A

Horizon Year Intersection Condition at La Costa Avenue and Cadencia Street

Alternatives	ICU Methodology			
	AM		PM	
	ICU	LOS	ICU	LOS
Horizon	0.485	A	0.488	A
Painted Median	0.490	A	0.494	A
Road Diet	0.485	A	0.488	A
Hybrid	0.485	A	0.488	A

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Summary of Roadway Segment Condition – Carlsbad Method

Existing base year		eastbound				westbound			
concept by direc	lane cap per hr	lanes	hrly vol	V/C	LOS	lanes	hrly vol	V/C	LOS
2 lanes open median									
Existing geometry									
AM	1800	2	502	0.14	A	2	983	0.27	A
PM	1800	2	1111	0.31	A	2	624	0.17	A
2 lanes w/median									
Painted median									
AM	1800	2	512	0.14	A	2	993	0.28	A
PM	1800	2	1121	0.31	A	2	634	0.18	A
1 lane open median									
Road diet									
AM	1800	1	502	0.28	A	1	983	0.55	A
PM	1800	1	1111	0.62	B	1	624	0.35	A
geometry varies									
Hybrid									
AM	1800	2	502	0.14	A	1	983	0.55	A
PM	1800	2	1111	0.31	A	1	624	0.35	A

Future volume									
	cap/ln	lanes		V/C	LOS	lanes		V/C	LOS
2 lanes open median									
Existing geometry									
AM	1800	2	612	0.33	A	2	1199	0.33	A
PM	1800	2	1355	0.38	A	2	761	0.21	A
2 lanes w/median									
Painted median									
AM	1800	2	625	0.34	A	2	1211	0.34	A
PM	1800	2	1368	0.38	A	2	773	0.21	A
1 lane open median									
Road diet									
AM	1800	1	612	0.67	B	1	1199	0.67	B
PM	1800	1	1355	0.75	C	1	761	0.42	A
geometry varies									
Hybrid									
AM	1800	2	612	0.33	A	1	1199	0.67	B
PM	1800	2	1355	0.38	A	1	761	0.42	A